Probability with Compound Events (Independent and Dependent)

Compound Events refer to 2 or more events occurring.
To find the probability of **compound events**, multiply the probability of each of the events together.

Ex. 1: Suppose you have a bag containing 2 black marbles and 3 red marbles. You reach into the bag, select a marble, see what color it is and replace it in the bag (Event #1). Then you repeat this process (Event #2). What is the probability of picking a red marble both times?

First you need to find the probability of picking a red marble the first time (or for the Event #1).

$$P(\text{red}) = \frac{3}{5} \quad \left(\frac{3 \text{ red marbles}}{5 \text{ total marbles}}\right)$$

Since the probability of picking a red marble once is $\frac{3}{5}$, the probability of picking a red marble the second time is again $\frac{3}{5}$.

Therefore, the probability of the **compound event** of picking a red marble both times is the product of the two event probabilities.

$$\frac{3}{5} \times \frac{3}{5} = \mathbf{\frac{9}{25}}$$

Since the first marble was **replaced** back in the bag before the second marble was drawn, the probability of the second drawing is **independent** of the probability of the first drawing. These are referred to **as independent events** --- in other words, the outcome of one event does not affect the outcome of the other event.

Ex. 2: Suppose you have a bag containing 2 black marbles and 3 red marbles. You reach into the bag, select a marble, see what color it is but **do not replace it** in the bag (Event #1). Then you reach in and select another marble. (Event #2). What is the probability of picking a red marble both times?

The probability of picking a red marble the first time (or for the Event #1) is the same as it was in Ex. 1 ----- 3 out of 5.

$$P(\text{red}) = \frac{3}{5} \quad \left(\frac{3 \text{ red marbles}}{5 \text{ total marbles}}\right)$$

However, since the first marble was not replaced back in the bag, the probability of picking a red marble the second time is **dependent** on the outcome of the first drawing.
Suppose we did pick a red marble and did not put it back in the bag. Now there are only 2 red marbles and 2 black marbles in the bag, and the probability of picking a red marble the second time (Event #2) is

$$P(\text{red}) = \frac{2}{4} \quad \left(\frac{2 \text{ red marbles}}{4 \text{ total marbles}}\right)$$

Therefore, the probability of the **compound event** of picking a red marble both times is the product of the two **dependent event** probabilities.

$$\frac{3}{5} \times \frac{2}{4} = \mathbf{\frac{6}{20}} = \mathbf{\frac{3}{10}}$$

*** An **Independent Event** occurs with **replacement**.
A **Dependent Event** occurs **without replacement**.

Probability Worksheet #1
Keystone Algebra
Sciandra/ Britton

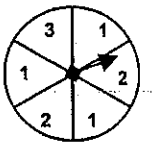
Name _____ Date _____

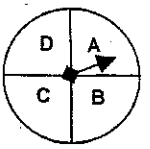
Probability with Compound Events (Independent and Dependent)
Practice

Describe the events by writing **I** for *independent event* or **D** for *dependent event.*

1. Ann draws a colored toothpick from a jar. Without replacing it, she draws a second toothpick. _____
2. John rolls a six on a number cube and then flips a coin that comes up heads. _____
3. Susie draws a card from a deck of cards and replaces it. She then draws a second card. _____
4. Seth draws a colored tile from a bag, replaces it; draws a second tile from the bag, replaces it; and then draws a tile a third time from the bag. _____
5. You draw a red marble from a bag, and then another red marble (without replacing the first marble)? ____

Using the two spinners, find each **compound** probability.





6. P(A and 2) _____ 7. P(D and 1) _____ 8. P(B and 3) _____

9. P(A and not 2) _____

A box contains 3 red marbles, 6 blue marbles, and 1 white marble. The marbles are selected at random, one at a time, and are **not replaced.** Find each **compound** probability.

10. P(blue and red) _____ 11. P(blue and blue) _____ 12. P(red and white and blue) _____

13. P(red and red and red) _____ 14. P(white and red and white) _____

Suppose that two tiles are drawn from the collection shown at the right. The first tile is replaced before the second is drawn. Find each **compound** probability.

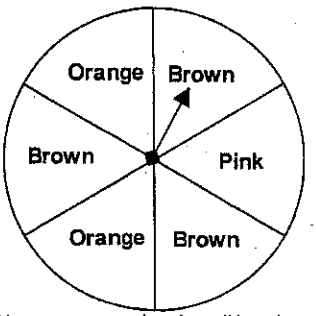
A	R	R	R	C
A	R	R	R	C
E	E	E	E	C

15. P(A and A) _____ 16. P(R and C) _____ 17. P(A and not R) _____

Suppose that two tiles are drawn from the same collection shown above. The first tile is **not** replaced before the second is drawn. Find each **compound** probability.

18. P(A and A) _____ 19. P(R and C) _____ 20. P(A and not R) _____

Use the spinner to the right for the next two problems.



21. If you spin the spinner twice, what is the probability of spinning orange then brown? _____

22. If you spin the spinner twice, what is the probability of spinning brown both times? _____

23. Kevin had 6 nickels and 4 dimes in his pocket. If he took out one coin and then a second coin without replacing the first coin ---
    (a) what is the probability that both coins were nickels? _____
    (b) what is the probability that both coins were dimes? _____
    (b) what is the probability that the first coin was a nickel and the second a dime? _____